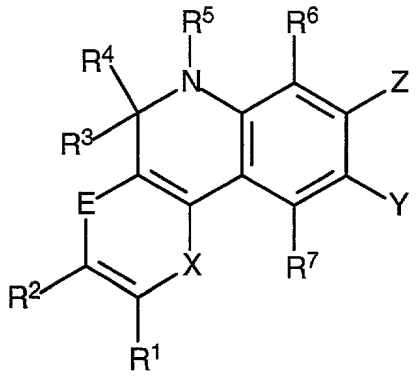
We claim

1. A compound of the formula



wherein

R^1 and R^2 are independently H, cyano, halogen, carboxylic acid, or sulfonic acid; or a C_1-C_6 alkyl or alkoxy that is optionally substituted by carboxylic acid, sulfonic acid, or halogen; or an aryl or heteroaryl ring that is optionally substituted one or more times by C_1-C_6 alkyl, C_1-C_6 perfluoroalkyl, cyano, halogen, azido, carboxylic acid, sulfonic acid, or halomethyl; or -L-R_X; or -L-S_C;

or R^1 in combination with R^2 forms a fused aromatic or heteroaromatic ring that is optionally sulfonated one or more times, or which ring is substituted by -L-R_X or -L-S_C;

or R^2 in combination with R^3 forms a 5- or 6-membered alicyclic ring;

R^3 and R^4 are independently H, C_1-C_6 alkyl that is optionally substituted by carboxylic acid, sulfonic acid, amino, hydroxy, or halogen; or an aromatic or heteroaromatic ring that is optionally substituted one or more times by C_1-C_6 alkyl, C_1-C_6 alkoxy, C_1-C_6 perfluoroalkyl, cyano, halogen, carboxylic acid, sulfonic acid, or halomethyl; or -L-R_X; or -L-S_C;

or R^3 in combination with R^4 forms a 5- or 6-membered alicyclic ring;

R^5 is H, methyl, carboxymethyl, a C_2-C_6 alkyl that is optionally substituted by carboxylic acid, sulfonic acid, amino, or halogen; or R^5 is an aryl or heteroaryl ring that is optionally substituted one or more times by C_1-C_6 alkyl, C_1-C_6 perfluoroalkyl, cyano, halogen, carboxylic acid, sulfonic acid, or halomethyl; or -L-R_X; or -L-S_C;

R^6 is H, cyano, halogen, carboxylic acid, or sulfonic acid; or a C_1-C_6 alkyl or alkoxy that is optionally substituted by carboxylic acid, sulfonic acid, or halogen; or an aryl or heteroaryl ring that is optionally substituted one or more times by C_1-C_6 alkyl, C_1-C_6 perfluoroalkyl, cyano, halogen, azido, carboxylic acid, sulfonic acid, or halomethyl; or -L-R_X; or -L-S_C;

or R^4 in combination with R^5, or R^5 in combination with R^6, forms a 5- or 6-membered alicyclic ring;

R^7 is hydrogen, alkyl having 1-6 carbons, or alkoxy having 1-6 carbons; or -L-R_X; or -L-S_C;

one of X and E is O, S, NR^8, or $CR^{1'}=CR^{2'}$, and the other is absent;

wherein R^8 is H, methyl, carboxymethyl, or a C_2-C_6 alkyl that is optionally substituted by carboxylic acid, sulfonic acid, amino, or halogen; or -L-R_X; or -L-S_C: and

$R^{1'}$ and $R^{2'}$ are independently H, cyano, halogen, carboxylic acid, or sulfonic acid; or a C_1-C_6 alkyl or alkoxy that is optionally substituted by carboxylic acid, sulfonic acid, or halogen; or an aryl or heteroaryl ring that is optionally substituted one or more times by C_1-C_6 alkyl, C_1-C_6 perfluoroalkyl, cyano, halogen, carboxylic acid, sulfonic acid, or halomethyl; or -L-R_X; or -L-S_C;

Y is H, OH, NH_2, NO, or -(CO)-R^9, or -(CO)-O-R^{10}, where R^9 and R^{10} are H, C_1-C_6 alkyl, or a substituted or unsubstituted aryl or heteroaryl ring system having 1-2 rings;

Z is H, OH, NHR^{17}, SH, or $C(CR^{11}R^{12})_2OH$; where R^{17} is a C_1-C_6 alkyl that is optionally substituted by carboxylic acid, sulfonic acid, amino, or halogen; R^{11} and R^{12} are independently C_1-C_6 alkyls that are optionally substituted by carboxylic acid, sulfonic acid, or halogen, or R^{11} and R^{12} taken in combination form a 5- or 6-membered alicyclic ring;

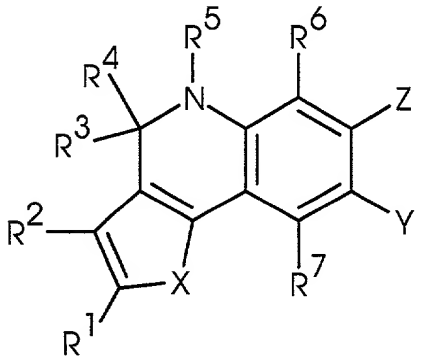
wherein L is a covalent linkage;

R_x is a reactive group; and

S_C is a conjugated substance.

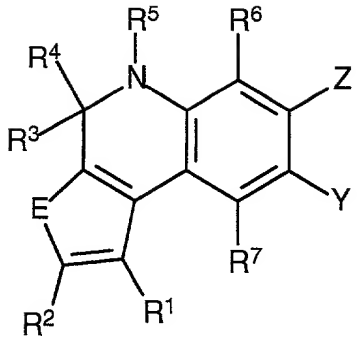
2. A compound, as claimed in Claim 1, wherein one of X and E is O, S, or $CR^{1'}=CR^{2'}$, and the other is absent.

3. A compound, as claimed in Claim 1, having the formula



wherein X is O or S.

4. A compound, as claimed in Claim 1, having the formula



wherein E is O or S.

5. A compound, as claimed in Claim 2, wherein X is S.

6. A compound as claimed in Claim 1, wherein

R^1 is H or sulfonic acid;

R^3 and R^4 are each methyl;

R^6 and R^7 are each hydrogen or methyl; and

Z is OH.

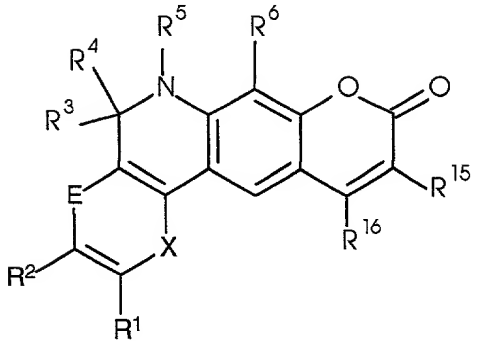
7. A compound, as claimed in Claim 1, wherein Y is H or -(CO)-H or NO.

8. A compound, as claimed in Claim 1, wherein each L is independently a single covalent bond, or L is a covalent linkage having 1-24 nonhydrogen atoms selected from the group consisting of C, N, O, P, and S and is composed of any combination of single, double, triple or aromatic carbon–carbon bonds, carbon–nitrogen bonds, nitrogen–nitrogen bonds, carbon–oxygen bonds, carbon–sulfur bonds, phosphorus-oxygen bonds, and phosphorus-nitrogen bonds.

9. A compound, as claimed in Claim 1, wherein R_x is an acrylamide, an activated ester of a carboxylic acid, an acyl azide, an acyl nitrile, an aldehyde, an alkyl halide, an amine, an anhydride, an aniline, an aryl halide, an azide, an aziridine, a boronate, a carboxylic acid, a diazoalkane, a haloacetamide, a halotriazine, a hydrazine, an imido ester, an isocyanate, an isothiocyanate, a maleimide, a phosphoramidite, a reactive platinum complex, a sulfonyl halide, or a thiol group.

10. A compound, as claimed in Claim 1, wherein S_c is an amino acid, a peptide, a protein, a tyramine, a monosaccharide, a polysaccharide, an ion-complexing moiety, a nucleoside, a nucleotide, an oligonucleotide, a nucleic acid, a hapten, a psoralen, a drug, a hormone, a lipid, a lipid assembly, a polymer, a polymeric microparticle, a biological cell, or a virus.

11. A compound of the formula



R^1, R^2, and R^6 are independently H, cyano, halogen, carboxylic acid, or sulfonic acid; or a C_1-C_6 alkyl or alkoxy that is optionally substituted by carboxylic acid, sulfonic acid, or halogen; or an aromatic or heteroaromatic ring that is optionally substituted one or more times by C_1-C_6 alkyl, C_1-C_6 perfluoroalkyl, cyano, halogen, azido, carboxylic acid, sulfonic acid, or halomethyl; or -L-R_x; or -L-S_C;

or R^1 in combination with R^2 forms a fused aromatic or heteroaromatic ring that is optionally sulfonated one or more times;

R^3 and R^4 are independently H, C_1-C_6 alkyl that is optionally substituted by carboxylic acid, sulfonic acid, amino, hydroxy, or halogen; or an aromatic or heteroaromatic ring that is optionally substituted one or more times by C_1-C_6 alkyl, C_1-C_6 alkoxy, C_1-C_6 perfluoroalkyl, cyano, halogen, carboxylic acid, sulfonic acid, or halomethyl; or -L-R_x; or -L-S_C;

or R^2 in combination with R^3, or R^3 in combination with R^4, forms a 5- or 6-membered alicyclic ring;

R^5 is H, methyl, carboxymethyl, a C_2-C_6 alkyl that is optionally substituted by carboxylic acid, sulfonic acid, amino, or halogen; or R^5 is an aryl or heteroaryl ring that is optionally substituted one or more times by C_1-C_6 alkyl, C_1-C_6 perfluoroalkyl, cyano, halogen, carboxylic acid, sulfonic acid, or halomethyl; or -L-R_x; or -L-S_C;

or R^4 in combination with R^5, or R^5 in combination with R^6, forms a 5- or 6-membered alicyclic ring;

one of X and E is O, S, NR^8, or $CR^{1'}=CR^{2'}$; the other is absent;

wherein R^8 is H, methyl, carboxymethyl, or a C_2-C_6 alkyl that is optionally substituted by carboxylic acid, sulfonic acid, amino, or halogen; or -L-R_x; or -L-S_C; and

$R^{1'}$ and $R^{2'}$ are independently H, cyano, halogen, carboxylic acid, or sulfonic acid; or a C_1-C_6 alkyl or alkoxy that is optionally substituted by carboxylic acid, sulfonic acid, or halogen; or an aryl or heteroaryl ring that is optionally substituted one or more times by C_1-C_6 alkyl, C_1-C_6 perfluoroalkyl, cyano, halogen, carboxylic acid, sulfonic acid, or halomethyl; or -L-R_x; or -L-S_C;

R^{15} and R^{16} are hydrogen, cyano, nitro, halogen, carboxylic acid, or sulfonic acid; or a C_1-C_6 alkyl that is optionally substituted by carboxylic acid, sulfonic acid, or halogen; or an aromatic or heteroaromatic ring system having 1-2 fused rings that is optionally substituted one or more times by C_1-C_6 alkyl, C_1-C_6 perfluoroalkyl, cyano, halogen, carboxylic acid, sulfonic acid, or halomethyl; or -L-R_x; or -L-S_C;

wherein L is a covalent linkage;

R_x is a reactive group; and

S_C is a conjugated substance.

12. A compound, as claimed in Claim 11, wherein one of X and E is O or S.

13. A compound, as claimed in Claim 12, wherein

R^6 and R^7 are H;

R^3 and R^4 are each methyl;

R^1 is H or sulfonic acid;

one of R^{15} and R^{16} is -L-R_x or -L-S_C, and the other is hydrogen, C_1-C_6 alkyl, C_1-C_6 perfluoroalkyl; or cyano;

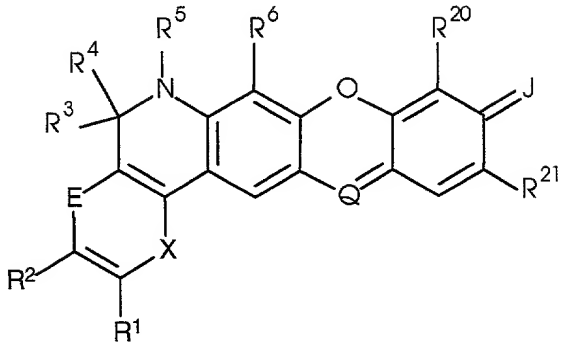
wherein L is a single covalent bond, or L is a covalent linkage having 1-24 nonhydrogen atoms selected from the group consisting of C, N, O, P, and S and is composed of any combination of single, double, triple or aromatic carbon–carbon bonds, carbon–nitrogen bonds, nitrogen–nitrogen bonds, carbon–oxygen bonds, carbon–sulfur bonds, phosphorus-oxygen bonds, and phosphorus-nitrogen bonds, and

wherein R_x, when present, is an acrylamide, an activated ester of a carboxylic acid, an acyl azide, an acyl nitrile, an aldehyde, an alkyl halide, an amine, an anhydride, an aniline, an aryl halide, an azide, an aziridine, a boronate, a carboxylic acid, a diazoalkane, a haloacetamide, a halotriazine, a hydrazine, an imido ester, an isocyanate, an isothiocyanate, a maleimide, a phosphoramidite, a reactive platinum complex, a sulfonyl halide, or a thiol group; and

wherein S_C , when present, is an amino acid, a peptide, a protein, a tyramine, a monosaccharide, a polysaccharide, an ion-complexing moiety, a nucleoside, a nucleotide, an oligonucleotide, a nucleic acid, a hapten, a psoralen, a drug, a hormone, a lipid, a lipid assembly, a polymer, a polymeric microparticle, a biological cell, or a virus.

14. A compound, as claimed in Claim 11, wherein one of R^{15} and R^{16} is an aromatic or heteroaromatic ring system having 1-2 fused rings that is optionally substituted one or more times by C_1-C_6 alkyl, C_1-C_6 perfluoroalkyl, cyano, halogen, carboxylic acid, sulfonic acid, or halomethyl.

15. A compound of the formula



wherein

R^1, R^2, and R^6 are independently H, cyano, nitro, halogen, carboxylic acid, or sulfonic acid; or a C_1-C_6 alkyl or alkoxy that is optionally substituted by carboxylic acid, sulfonic acid, or halogen; or an aromatic or heteroaromatic ring that is optionally substituted one or more times by C_1-C_6 alkyl, C_1-C_6 perfluoroalkyl, cyano, halogen, azido, carboxylic acid, sulfonic acid, or halomethyl; or -L-R_x; or -L-S_C;

or R^1 in combination with R^2 forms a fused aromatic or heteroaromatic ring that is optionally sulfonated one or more times;

R^3 and R^4 are independently H, C_1-C_6 alkyl that is optionally substituted by carboxylic acid, sulfonic acid, amino, hydroxy, or halogen; or an aromatic or heteroaromatic ring that is optionally substituted one or more times by C_1-C_6 alkyl, C_1-C_6 perfluoroalkyl, cyano, halogen, carboxylic acid, sulfonic acid, or halomethyl; or -L-R_x; or -L-S_C;

or R^2 in combination with R^3, or R^3 in combination with R^4, forms a 5- or 6-membered alicyclic ring;

R^5 is H, methyl, carboxymethyl, a C_2-C_6 alkyl that is optionally substituted by carboxylic acid, sulfonic acid, amino, or halogen; or R^5 is an aryl or heteroaryl ring that is optionally

substituted one or more times by C_1-C_6 alkyl, C_1-C_6 perfluoroalkyl, cyano, halogen, carboxylic acid, sulfonic acid, or halomethyl; or R^5 is -L-R_x or -L-S_C;

or R^4 in combination with R^5, or R^5 in combination with R^6, forms a 5- or 6-membered alicyclic ring;

one of X and E is O, S, NR^8, or $CR^{1'}=CR^{2'}$; and the other is absent;

wherein R^8 is H, methyl, carboxymethyl, or a C_2-C_6 alkyl that is optionally substituted by carboxylic acid, sulfonic acid, amino, or halogen; or -L-R_x; or -L-S_C; and

$R^{1'}$ and $R^{2'}$ are independently H, cyano, halogen, carboxylic acid, or sulfonic acid; or a C_1-C_6 alkyl or alkoxy that is optionally substituted by carboxylic acid, sulfonic acid, or halogen; or an aryl or heteroaryl ring that is optionally substituted one or more times by C_1-C_6 alkyl, C_1-C_6 perfluoroalkyl, cyano, halogen, carboxylic acid, sulfonic acid, or halomethyl; or -L-R_x; or -L-S_C;

R^{20} and R^{21} are hydrogen, cyano, halogen, carboxylic acid, or sulfonic acid; or a C_1-C_6 alkyl or alkoxy that is optionally substituted by carboxylic acid, sulfonic acid, or halogen; or an aromatic or heteroaromatic ring that is optionally substituted one or more times by C_1-C_6 alkyl, C_1-C_6 perfluoroalkyl, cyano, halogen, carboxylic acid, sulfonic acid, or halomethyl; or -L-R_x; or -L-S_C;

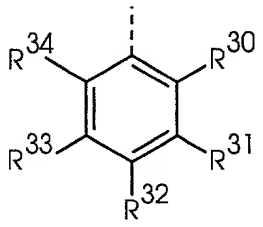
J is O or $NR^{37}R^{38}$;

where R^{37} and R^{38} are independently H, C_1-C_6 alkyl that is optionally substituted by carboxylic acid, sulfonic acid, amino, or halogen; an aryl or heteroaryl ring; or R^{37} in combination with R^{38} forms a saturated 5- or 6-membered heterocycle that is a piperidine, a morpholine, a pyrrolidine or a piperazine, each of which is optionally substituted by methyl, carboxylic acid, or a carboxylic acid ester of a C_1-C_6 alkyl; or

-L-R_x or -L-S_C;

or R^{37} in combination with R^{20}, or R^{38} in combination with R^{21}, or both, form a 5- or 6-membered ring that is saturated or unsaturated, and is optionally substituted by one or more sulfonic acids, or C_1-C_6 alkyl that is optionally substituted by sulfonic acid;

Q is N or CR^{28}, wherein R^{28} is H, F, CN, carboxylic acid, or a carboxylic acid ester of a C_1-C_6 alcohol; or R^{28} is a C_1-C_6 alkyl that is optionally substituted by carboxylic acid, sulfonic acid, amino, or halogen; or R^{28} has the formula



where R^{30}, R^{31}, R^{32}, R^{33} and R^{34} are independently H, F, Cl, Br, I, sulfonic acid, carboxylic acid, CN, nitro, hydroxy, azido, amino, hydrazino; or C_1-C_{18} alkyl, C_1-C_{18} alkoxy, C_1-C_{18} alkylthio, C_1-C_{18} alkanoylamino, C_1-C_{18} alkylaminocarbonyl, C_2-C_{36} dialkylaminocarbonyl, C_1-C_{18} alkyloxycarbonyl, or C_6-C_{18} arylcarboxamido, the alkyl or aryl portions of which are optionally substituted one or more times by F, Cl, Br, I, hydroxy, carboxylic acid, a carboxylic acid ester of a C_1-C_6 alcohol, sulfonic acid, amino, alkylamino, dialkylamino or alkoxy, the alkyl portions of each having 1-6 carbons; or one pair of adjacent substituents R^{31} and R^{32}, R^{32} and R^{33} or R^{33} and R^{34}, when taken in combination, form a fused 6-membered aromatic ring that is optionally further substituted by carboxylic acid; or one or more of R^{30}, R^{31}, R^{32}, R^{33} and R^{34} is -L-R_x or -L-S_C; and

wherein L is a covalent linkage;

R_x is a reactive group; and

S_C is a conjugated substance.

16. A compound, as claimed in Claim 15, wherein Q is N.

17. A compound, as claimed in Claim 15, wherein J is O and Q is CR^{28}.

18. A compound, as claimed in Claim 17, wherein one of R^5, R^{21}, R^{30}, R^{31}, R^{32}, R^{33}, and R^{34} is $-L-R_x$ or $-L-S_C$.

19. A compound, as claimed in Claim 15, wherein

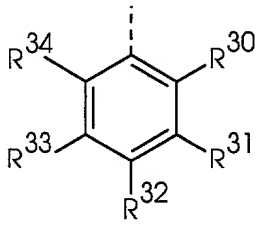
R^3 and R^4 are each methyl;

R^1 is H or a sulfonic acid;

R^6 is H; and

J is $NR^{37}R^{38}$.

20. A compound, as claimed in Claim 19, wherein Q has the formula CR^{28}, wherein R^{28} has the formula



wherein one of R^{30}-R^{34} is $-L-R_x$ or $-L-S_C$; and

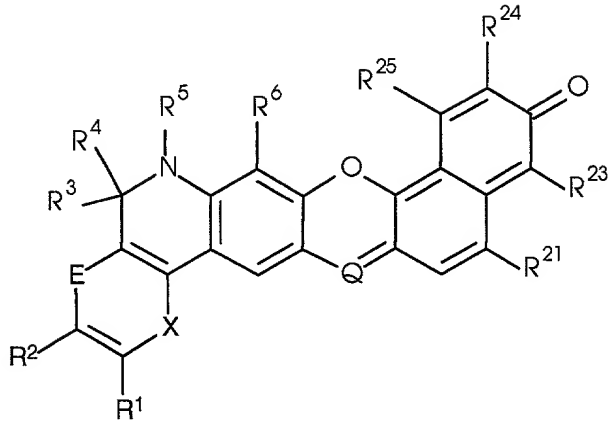
wherein L is a single covalent bond, or L is a covalent linkage having 1-24 nonhydrogen

atoms selected from the group consisting of C, N, O, P, and S and is composed of any combination of single, double, triple or aromatic carbon–carbon bonds, carbon–nitrogen bonds, nitrogen–nitrogen bonds, carbon–oxygen bonds, carbon–sulfur bonds, phosphorus-oxygen bonds, and phosphorus-nitrogen bonds, and

wherein R_X, when present, is an acrylamide, an activated ester of a carboxylic acid, an acyl azide, an acyl nitrile, an aldehyde, an alkyl halide, an amine, an anhydride, an aniline, an aryl halide, an azide, an aziridine, a boronate, a carboxylic acid, a diazoalkane, a haloacetamide, a halotriazine, a hydrazine, an imido ester, an isocyanate, an isothiocyanate, a maleimide, a phosphoramidite, a reactive platinum complex, a sulfonyl halide, or a thiol group; and

wherein S_C , when present, is an amino acid, a peptide, a protein, a tyramine, a monosaccharide, a polysaccharide, an ion-complexing moiety, a nucleoside, a nucleotide, an oligonucleotide, a nucleic acid, a hapten, a psoralen, a drug, a hormone, a lipid, a lipid assembly, a polymer, a polymeric microparticle, a biological cell, or a virus.

21. A compound of the formula



wherein

R^1, R^2, and R^6 are independently H, cyano, halogen, carboxylic acid, or sulfonic acid; or a C_1-C_6 alkyl or alkoxy that is optionally substituted by carboxylic acid, sulfonic acid, or halogen; or an aromatic or heteroaromatic ring that is optionally substituted one or more times by C_1-C_6 alkyl, C_1-C_6 perfluoroalkyl, cyano, halogen, azido, carboxylic acid, sulfonic acid, or halomethyl; or -L-R_x; or -L-S_C;

or R^1 in combination with R^2 forms a fused aromatic or heteroaromatic ring that is optionally sulfonated one or more times;

R^3 and R^4 are independently C_1-C_6 alkyl that is optionally substituted by carboxylic acid, sulfonic acid, amino, hydroxy, or halogen; or an aromatic or heteroaromatic ring that is optionally substituted one or more times by C_1-C_6 alkyl, C_1-C_6 perfluoroalkyl, cyano, halogen, carboxylic acid, sulfonic acid, or halomethyl;

or R^2 in combination with R^3, or R^3 in combination with R^4, forms a 5- or 6-membered alicyclic ring;

R^5 is H, methyl, carboxymethyl, a C_2-C_6 alkyl that is optionally substituted by carboxylic acid, sulfonic acid, amino, or halogen; or R^5 is an aryl or heteroaryl ring that is optionally substituted one or more times by C_1-C_6 alkyl, C_1-C_6 perfluoroalkyl, cyano, halogen, carboxylic acid, sulfonic acid, or halomethyl;

or R^4 in combination with R^5, or R^5 in combination with R^6, forms a 5- or 6-membered alicyclic ring;

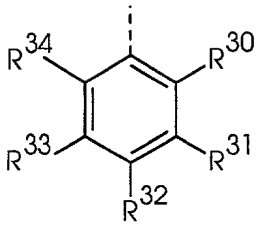
one of E and X is O, S, NR^8, or $CR^{1'}=CR^{2'}$; the other is absent;

wherein R^8 is H, methyl, carboxymethyl, or a C_2-C_6 alkyl that is optionally substituted by carboxylic acid, sulfonic acid, amino, or halogen; and

$R^{1'}$ and $R^{2'}$ are independently H, cyano, halogen, carboxylic acid, or sulfonic acid; or a C_1-C_6 alkyl or alkoxy that is optionally substituted by carboxylic acid, sulfonic acid, or halogen; or an aryl or heteroaryl ring that is optionally substituted one or more times by C_1-C_6 alkyl, C_1-C_6 perfluoroalkyl, cyano, halogen, carboxylic acid, sulfonic acid, or halomethyl;

R^{21}, R^{23}, R^{24}, and R^{25} are hydrogen, cyano, nitro, halogen, carboxylic acid, or sulfonic acid; or a C_1-C_6 alkyl that is optionally substituted by carboxylic acid, sulfonic acid, or halogen; or an aromatic or heteroaromatic ring that is optionally substituted one or more times by C_1-C_6 alkyl, C_1-C_6 perfluoroalkyl, cyano, halogen, carboxylic acid, sulfonic acid, or halomethyl; or -L-R_x; or -L-S_C;

Q is N or CR^{28}, wherein R^{28} is H, F, CN, carboxylic acid, or a carboxylic acid ester of a C_1-C_6 alcohol; or R^{28} is a C_1-C_6 alkyl that is optionally substituted by carboxylic acid, sulfonic acid, amino, or halogen; or R^{28} has the formula



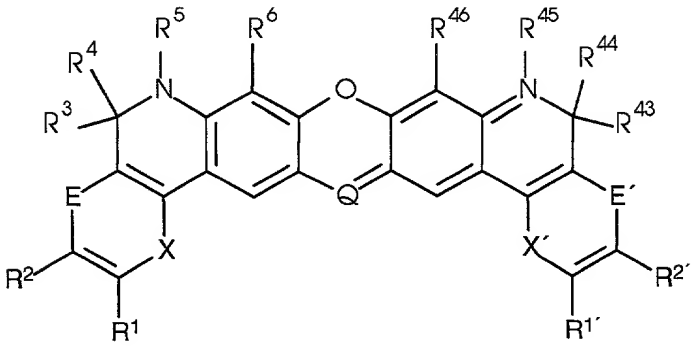
where R^{30}, R^{31}, R^{32}, R^{33} and R^{34} are independently H, F, Cl, Br, I, sulfonic acid, carboxylic acid, CN, nitro, hydroxy, azido, amino, hydrazino; or C_1-C_{18} alkyl, C_1-C_{18} alkoxy, C_1-C_{18} alkylthio, C_1-C_{18} alkanoylamino, C_1-C_{18} alkylaminocarbonyl, C_2-C_{36} dialkylaminocarbonyl, C_1-C_{18} alkyloxycarbonyl, or C_6-C_{18} arylcarboxamido, the alkyl or aryl portions of which are optionally substituted one or more times by F, Cl, Br, I, hydroxy, carboxylic acid, a carboxylic acid ester of a C_1-C_6 alcohol, amino, alkylamino, dialkylamino or alkoxy, the alkyl portions of each having 1-6 carbons; or one pair of adjacent substituents R^{31} and R^{32}, R^{32} and R^{33} or R^{33} and R^{34}, when taken in combination, form a fused 6-membered aromatic ring that is optionally further substituted by carboxylic acid; or one or more of R^{30}, R^{31}, R^{32}, R^{33} and R^{34} is -L-R_x or -L-S_C; and

wherein L is a covalent linkage;

R_x is a reactive group; and

S_C is a conjugated substance.

22. A compound having the formula



wherein

R^1, R^2, R^6, R^{41}, R^{42}, and R^{46} are independently H, cyano, nitro, halogen, carboxylic acid, or sulfonic acid; or a C_1-C_6 alkyl or alkoxy that is optionally substituted by carboxylic acid, sulfonic acid, or halogen; or an aromatic or heteroaromatic ring that is optionally substituted one or more times by C_1-C_6 alkyl, C_1-C_6 perfluoroalkyl, cyano, halogen, azido, carboxylic acid, sulfonic acid, or halomethyl; or -L-R_x; or -L-S_C;

or R^1 in combination with R^2, or R^{41} in combination with R^{42}, or both, forms a fused aromatic or heteroaromatic ring that is optionally sulfonated one or more times;

R^3, R^4, R^{43}, and R^{44} are independently H, C_1-C_6 alkyl that is optionally substituted by carboxylic acid, sulfonic acid, amino, hydroxy, or halogen; or an aromatic or heteroaromatic ring that is optionally substituted one or more times by C_1-C_6 alkyl, C_1-C_6 perfluoroalkyl, cyano, halogen, carboxylic acid, sulfonic acid, or halomethyl;

or R^2 in combination with R^3, R^{42} in combination with R^{43}, or R^3 in combination with R^4, or R^{43} in combination with R^{44}, or any combination thereof, forms a 5- or 6-membered alicyclic ring;

R^5 and R^{45} are independently H, methyl, carboxymethyl, a C_2-C_6 alkyl that is optionally substituted by carboxylic acid, sulfonic acid, amino, or halogen; or R^5 is an aryl or heteroaryl ring that is optionally substituted one or more times by C_1-C_6 alkyl, C_1-C_6 perfluoroalkyl, cyano, halogen, carboxylic acid, sulfonic acid, or halomethyl;

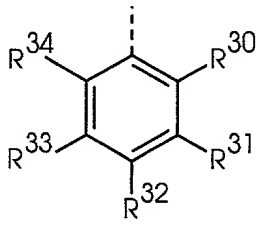
or R^4 in combination with R^5, or R^5 in combination with R^6, or R^{44} in combination with R^{45}, or R^{45} in combination with R^{46}, or any combination thereof, forms a 5- or 6-membered alicyclic ring;

one of E and X is O, S, NR^8, or $CR^{1'}=CR^{2'}$; the other is absent; and one of E′ and X′ is O, S, NR^8, or $CR^{1'}=CR^{2'}$; the other is absent;

wherein R^8 is H, methyl, carboxymethyl, or a C_2-C_6 alkyl that is optionally substituted by carboxylic acid, sulfonic acid, amino, or halogen; and

$R^{1'}$ and $R^{2'}$ are independently H, cyano, halogen, carboxylic acid, or sulfonic acid; or a C_1-C_6 alkyl or alkoxy that is optionally substituted by carboxylic acid, sulfonic acid, or halogen; or an aryl or heteroaryl ring that is optionally substituted one or more times by C_1-C_6 alkyl, C_1-C_6 perfluoroalkyl, cyano, halogen, carboxylic acid, sulfonic acid, or halomethyl;

Q is N or CR^{28}, wherein R^{28} is H, F, CN, carboxylic acid, or a carboxylic acid ester of a C_1-C_6 alcohol; or R^{28} is a C_1-C_6 alkyl that is optionally substituted by carboxylic acid, sulfonic acid, amino, or halogen; or R^{28} has the formula



where R^{30}, R^{31}, R^{32}, R^{33} and R^{34} are independently H, F, Cl, Br, I, sulfonic acid, carboxylic acid, CN, nitro, hydroxy, azido, amino, hydrazino; or C_1-C_{18} alkyl, C_1-C_{18} alkoxy, C_1-C_{18} alkylthio, C_1-C_{18} alkanoylamino, C_1-C_{18} alkylaminocarbonyl, C_2-C_{36} dialkylaminocarbonyl, C_1-C_{18} alkyloxycarbonyl, or C_6-C_{18} arylcarboxamido, the alkyl or aryl portions of which are optionally substituted one or more times by F, Cl, Br, I, hydroxy, carboxylic acid, a carboxylic acid ester of a C_1-C_6 alcohol, amino, alkylamino, dialkylamino or alkoxy, the alkyl portions of each having 1-6 carbons; or one pair of adjacent substituents R^{31} and R^{32}, R^{32} and R^{33} or R^{33} and R^{34}, when taken in combination, form a fused 6-membered aromatic ring that is optionally further substituted by carboxylic acid; or one or more of R^{30}, R^{31}, R^{32}, R^{33} and R^{34} is -L-R_x or -L-S_C; and

wherein L is a covalent linkage;

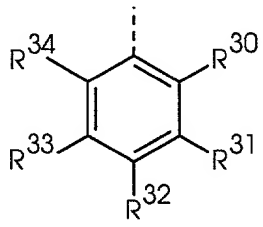
R_x is a reactive group; and

S_C is a conjugated substance.

23. A compound, as claimed in Claim 22, wherein

X = X′, E = E′, $R^1 = R^{41}$, and $R^2 = R^{42}$.

24. A compound, as claimed in Claim 22, wherein Q has the formula CR^{28}, and R^{28} has the formula



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25. A compound, as claimed in Claim 24, wherein one of R^5, R^{21}, R^{30}, R^{31}, R^{32}, R^{33}, R^{34}, and R^{45} is -L-R_x or -L-S_C.

26. A compound, as claimed in Claim 24, wherein

R^3, R^4, R^{43}, and R^{44} are each methyl;

R^1 and R^{41} are independently H or sulfonic acid; and

R^6 and R^{46} are H.

27. A compound, as claimed in Claim 24, wherein the compound is substituted one or more times by sulfonic acid.

28. A compound, as claimed in Claim 22, wherein one of R^1, $R^{1'}$, R^2, $R^{2'}$, R^3, R^4, R^5, R^6, R^7, R^8, R^{15}, R^{16}, R^{20}, R^{21}, R^{23}, R^{24}, R^{25}, R^{30}, R^{31}, R^{32}, R^{33}, R^{34}, R^{37}, R^{38}, R^{41}, R^{42}, R^{43}, R^{44}, R^{45}, and R^{46} is an -L--R_x or -L-S_C.

29. A compound, as claimed in Claim 28, wherein each L is independently a single covalent bond, or L is a covalent linkage having 1-24 nonhydrogen atoms selected from the group consisting of C, N, O, P, and S and is composed of any combination of single, double, triple or aromatic carbon–carbon bonds, carbon–nitrogen bonds, nitrogen–nitrogen bonds, carbon–oxygen bonds, carbon–sulfur bonds, phosphorus-oxygen bonds, and phosphorus-nitrogen bonds.

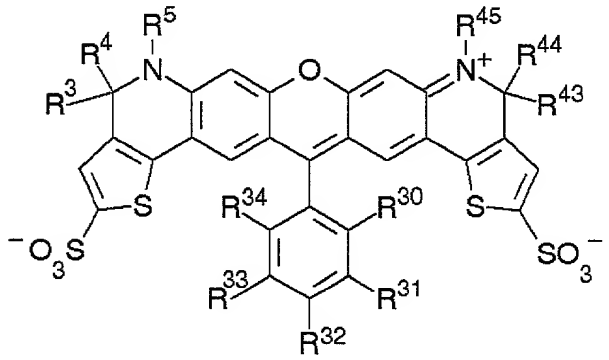
30. A compound, as claimed in Claim 28, wherein R_X is an acrylamide, an activated ester of a carboxylic acid, an acyl azide, an acyl nitrile, an aldehyde, an alkyl halide, an amine, an anhydride, an aniline, an aryl halide, an azide, an aziridine, a boronate, a carboxylic acid, a diazoalkane, a haloacetamide, a halotriazine, a hydrazine, an imido ester, an isocyanate, an isothiocyanate, a maleimide, a phosphoramidite, a reactive platinum complex, a sulfonyl halide, or a thiol group.

31. A compound, as claimed in Claim 28, wherein R_x is a phosphoramidite, a succinimidyl ester of a carboxylic acid, a haloacetamide, a hydrazine, an isothiocyanate, a maleimide group, a perfluorobenzamido, an azidoperfluorobenzamido group, or a reactive platinum complex.

32. A compound, as claimed in Claim 28, wherein S_c is an amino acid, a peptide, a protein, a tyramine, a monosaccharide, a polysaccharide, an ion-complexing moiety, a nucleoside, a nucleotide, an oligonucleotide, a nucleic acid, a hapten, a psoralen, a drug, a hormone, a lipid, a lipid assembly, a polymer, a polymeric microparticle, a biological cell, or a virus.

33. A compound, as claimed in Claim 28, wherein S_c is an amino acid, a peptide, a protein, an ion-complexing moiety, a nucleoside, a nucleotide, an oligonucleotide, or a nucleic acid.

34. A compound, as claimed in Claim 28, having the formula:



wherein R^3, R^4, R^5, R^{43}, R^{44} , and R^{45} are independently methyl or ethyl;

R^{30} is sulfonic acid or carboxylic acid;

R^{31} and R^{34} are independently H, F, or Cl;

one of R^{32} and R^{33} is H, F, or Cl, and the other of R^{32} and R^{33} is -L-R_x or -L-S_c,

wherein L is a covalent linkage of the formula $-S(CH_2)_aCOO(CH_2)_b-$ or the formula $-S(CH_2)_aCONH(CH_2)_b-$

wherein a is an integer between 0 and 10, and b is an integer between 0 and 10 provided that a and b are not both 0; and

wherein R_x , where present, is a carboxylic acid, an activated ester of a carboxylic acid, a haloacetamide, a hydrazine, an isothiocyanate, a maleimide group, or a reactive platinum complex.; and

wherein S_c, where present, is an amino acid, a peptide, a protein, an ion-complexing moiety, a nucleoside, a nucleotide, an oligonucleotide, or a nucleic acid.

35. A compound, as claimed in Claim 34, wherein R_x is a maleimide group or is a succcinimidyl ester of a carboxylic acid.

36. A compound, as claimed in Claim 34, wherein S_c is peptide or a protein or a lectin.

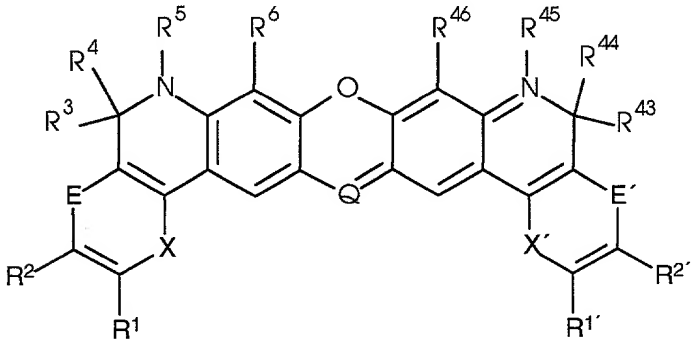
37. A compound, as claimed in Claim 34, wherein S_c is an antibody or antibody fragment.

38. A compound, as claimed in Claim 34, wherein S_c is a nucleotide or an oligonucleotide.

39. A compound, as claimed in Claim 34, wherein S_c is a BAPTA or APTRA ion-complexing moiety.

40. A method of staining a biological sample, comprising:

combining a dye solution comprising a compound of the formula



wherein

R^1, R^2, R^6, R^{41}, R^{42}, and R^{46} are independently H, cyano, nitro, halogen, carboxylic acid, or sulfonic acid; or a C_1-C_6 alkyl or alkoxy that is optionally substituted by carboxylic acid, sulfonic acid, or halogen; or an aromatic or heteroaromatic ring that is optionally substituted one or more times by C_1-C_6 alkyl, C_1-C_6 perfluoroalkyl, cyano, halogen, azido, carboxylic acid, sulfonic acid, or halomethyl; or -L-R_x; or -L-S_C;

or R^1 in combination with R^2, or R^{41} in combination with R^{42}, or both, forms a fused aromatic or heteroaromatic ring that is optionally sulfonated one or more times;

R^3, R^4, R^{43}, and R^{44} are independently H, C_1-C_6 alkyl that is optionally substituted by carboxylic acid, sulfonic acid, amino, hydroxy, or halogen; or an aromatic or heteroaromatic ring that is optionally substituted one or more times by C_1-C_6 alkyl, C_1-C_6 perfluoroalkyl, cyano, halogen, carboxylic acid, sulfonic acid, or halomethyl;

or R^2 in combination with R^3, R^{42} in combination with R^{43}, or R^3 in combination with R^4, or R^{43} in combination with R^{44}, or any combination thereof, forms a 5- or 6-membered alicyclic ring;

R^5 and R^{45} are independently H, methyl, carboxymethyl, a C_2-C_6 alkyl that is optionally substituted by carboxylic acid, sulfonic acid, amino, or halogen; or R^5 is an aryl or heteroaryl ring that is optionally substituted one or more times by C_1-C_6 alkyl, C_1-C_6 perfluoroalkyl, cyano, halogen, carboxylic acid, sulfonic acid, or halomethyl;

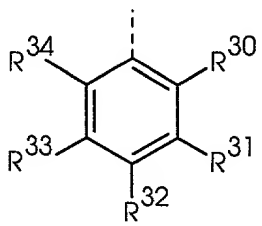
or R^4 in combination with R^5, or R^5 in combination with R^6, or R^{44} in combination with R^{45}, or R^{45} in combination with R^{46}, or any combination thereof, forms a 5- or 6-membered alicyclic ring;

one of E and X is O, S, NR^8, or $CR^{1'}=CR^{2'}$; the other is absent; and one of E´ and X´ is O, S, NR^8, or $CR^{1'}=CR^{2'}$; the other is absent;

wherein R^8 is H, methyl, carboxymethyl, or a C_2-C_6 alkyl that is optionally substituted by carboxylic acid, sulfonic acid, amino, or halogen; and

$R^{1'}$ and $R^{2'}$ are independently H, cyano, halogen, carboxylic acid, or sulfonic acid; or a C_1-C_6 alkyl or alkoxy that is optionally substituted by carboxylic acid, sulfonic acid, or halogen; or an aryl or heteroaryl ring that is optionally substituted one or more times by C_1-C_6 alkyl, C_1-C_6 perfluoroalkyl, cyano, halogen, carboxylic acid, sulfonic acid, or halomethyl;

Q is N or CR^{28}, wherein R^{28} is H, F, CN, carboxylic acid, or a carboxylic acid ester of a C_1-C_6 alcohol; or R^{28} is a C_1-C_6 alkyl that is optionally substituted by carboxylic acid, sulfonic acid, amino, or halogen; or R^{28} has the formula



where R^{30}, R^{31}, R^{32}, R^{33} and R^{34} are independently H, F, Cl, Br, I, sulfonic acid, carboxylic acid, CN, nitro, hydroxy, azido, amino, hydrazino; or C_1-C_{18} alkyl, C_1-C_{18} alkoxy, C_1-C_{18} alkylthio, C_1-C_{18} alkanoylamino, C_1-C_{18} alkylaminocarbonyl, C_2-C_{36} dialkylaminocarbonyl, C_1-C_{18} alkyloxycarbonyl, or C_6-C_{18} arylcarboxamido, the alkyl or aryl portions of which are optionally substituted one or more times by F, Cl, Br, I, hydroxy, carboxylic acid, a carboxylic acid ester of a C_1-C_6 alcohol, amino, alkylamino, dialkylamino or alkoxy, the alkyl portions of each having 1-6 carbons; or one pair of adjacent substituents R^{31} and R^{32}, R^{32} and R^{33} or R^{33} and R^{34}, when taken in combination, form a fused 6-membered aromatic ring that is optionally further substituted by carboxylic acid; or one or more of R^{30}, R^{31}, R^{32}, R^{33} and R^{34} is -L-R_x or -L-S_C; and

wherein L is a covalent linkage;

R_x is a reactive group; and

S_C is a conjugated substance;

with a biological sample in a concentration sufficient to yield a detectable optical response under the desired conditions.

41. A method, as claimed in Claim 40, further comprising combining the sample with an additional detection reagent that has spectral properties that are detectably different from said optical response.

42. A method, as claimed in Claim 40, further comprising the step of determining a characteristic of the sample by comparing the optical response with a standard response parameter.

43. A method, as claimed in Claim 40, wherein the sample comprises cells.

44. A method, as claimed in Claim 40, wherein the sample is immobilized in or on a solid or semi-solid matrix that is a membrane, an electrophoretic gel, a silicon chip, a glass slide, a microwell plate, or a microfluidic chip.

45. A method, as claimed in Claim 40, further comprising tracing the temporal or spatial location of the optical response within the sample.

46. A method, as claimed in Claim 40, wherein for said compound

at least one of R^{28}, R^{30}, R^{31}, R^{32}, R^{33}, R^{34}, R^{37} and R^{38} is -L-R_x or -L-S_C;

R_x is a carboxylic acid, an activated ester of a carboxylic acid, an amine, an azide, a hydrazine, a haloacetamide, an alkyl halide, an isothiocyanate, or a maleimide group; and

S_c is an amino acid, a peptide, a protein, a polysaccharide, a nucleotide, a nucleoside, an oligonucleotide, a nucleic acid polymer, an ion-complexing moiety, a lipid, or a non-biological organic polymer or polymeric microparticle, that is optionally bound to one or more additional fluorophores that are the same or different.

47. A method, as claimed in Claim 46, wherein for said compound, R^{28} is an -L-S_C, and S_C is an ion-complexing moiety that is a BAPTA or an APTRA.

48. A method as claimed in Claim 40, wherein at least one of R^{28}, R^{30}, R^{31}, R^{32}, R^{33}, R^{34}, R^{37} and R^{38} is -L-S_C, and S_C is a nucleoside, a nucleotide, an oligonucleotide, or a nucleic acid polymer.